DERWENT-ACC-NO: 2000-469536

DERWENT-WEEK: 200126

TITLE: Failure logging system includes diagnostic controller which releases interruption to output interrupt signal to CPU, when completion response signal is not received

PATENT-ASSIGNEE: NEC CORP[NIDE]

PRIORITY-DATA: 1998JP-0350432 (December 9, 1998)

PATENT-FAMILY:

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ABSTRACTED-PUB-NO: JP2000172536A

BASIC-ABSTRACT:

NOVELTY - A mask controller (42) controls the **masking of interrupt signal,** based on **failure** generation **indication** output by CPU (1). A receiving portion (44) judges whether failure process completion response signal (121) is received from CPU in preset time. When the completion response signal is not received, a diagnostic controller (40) releases the **mask and outputs an interrupt signal** forcedly to CPU.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(a) failure logging procedure;

(b) program for failure logging procedure

USE - Failure logging system used for intimating central processing unit about failure generation using diagnostic apparatus.

ADVANTAGE - Since the failure is informed by interruption signal, even when CPU has fallen into endless loop, it can reset to original process normally after failure loop process execution and leak of data for failure analysis is eliminated.

DESCRIPTION OF DRAWING(S) - The figure shows the block diagram of components of failure logging system.

CPU 1

Diagnostic controller 40

Mask controller 42

Receiving portion 44

Failure process completion response signal 121

CHOSEN-DRAWING: Dwg.1/2

TITLE-TERMS: FAIL LOG SYSTEM DIAGNOSE CONTROL RELEASE INTERRUPT OUTPUT INTERRUPT SIGNAL CPU COMPLETE RESPOND SIGNAL RECEIVE

DERWENT-CLASS: T01

EPI-CODES: T01-G05C1;

SECONDARY-ACC-NO:
Non-CPI Secondary Accession Numbers: N2000-350781

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing the failure logging structure of a system by the gestalt of operation of this invention.
[Drawing 2] It is the flow chart which shows actuation of the gestalt of operation of this invention.
[Description of Notations]
1 Central Processing Unit
2 Main Storage
3 Peripheral Control Unit
4 Diagnostic Equipment
10 Interruption Reception Section
11 Error-Processing Terminate-Signal Control Section
12 Mask Control Unit
40 Diagnostic Control Section
41 Advice Section of Interruption
42 Mask Control Section
43 Failure Detection Section
44 Error-Processing Termination Response Receive Section
45 Timer Section
111 Advice Signal of Failure Generating
121 Error-Processing Terminate Signal

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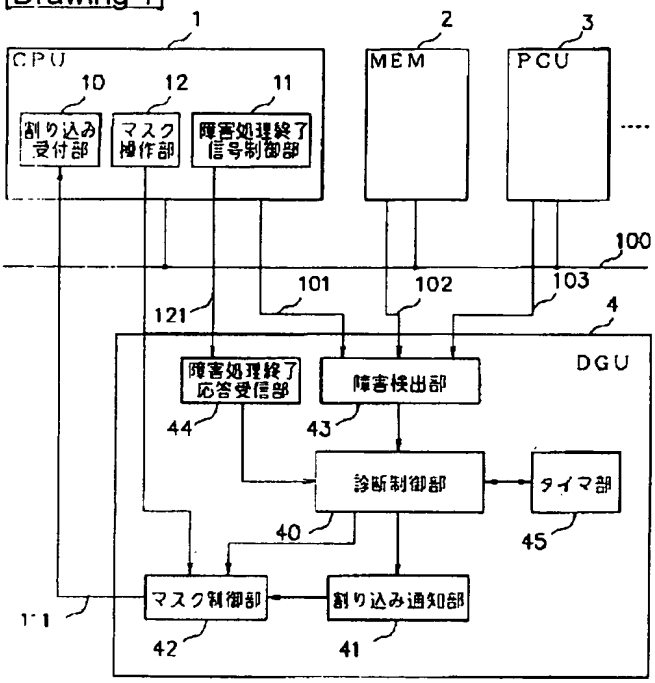
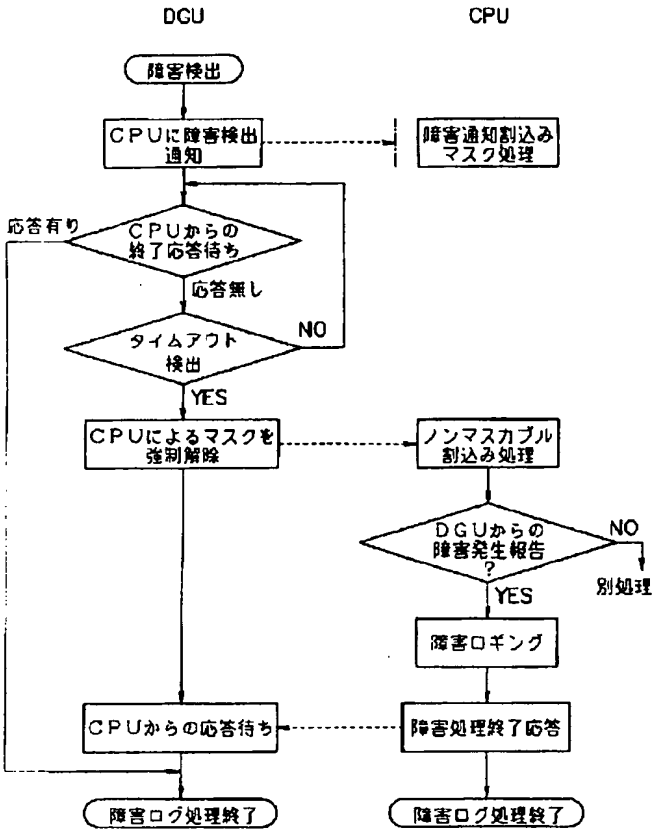
DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention relates to amelioration of the logging method of the fault information performed by the central processing unit, when failure generating in the system from diagnostic equipment is especially notified to a central processing unit about the storage which memorized the failure logging system, the approach, and the program.

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:FFECT OF THE INVENTION

Effect of the Invention] As explained above, when diagnostic equipment detects the failure in a system ıccording to this invention A central processing unit notifies generating of the failure according to the ıasked state of a controllable mask control section. The error-processing termination response which hows that error processing by the central processing unit performed by answering this advice was ompleted By disregarding the masked state of a mask control section and having notified generating of a ailure by non masker bull interruption compulsorily, when not received in the predetermined time set up eforehand When the central processing unit 1 has not lapsed into an endless loop, it can return to the ıriginal processing normally after failure logging processing activation. Moreover, even when the central ırocessing unit has lapsed into the endless loop, failure hysteresis can be saved and it is effective in the ıbility to lose the omission of data required for failure analysis.
0031] Furthermore, since the interruption reception section in a central processing unit assigns only a non ıasker bull interruption terminal for error processing, it is effective in becoming possible to use a masker ıull interruption terminal for general processing.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, in a Prior art, one interrupt level general for actuation which is called error processing and which is not usually processing will be used, the usual interrupt request was interrupted and there was a problem that overhead processing called decoding of a factor was needed. Although there is also a method of not using the usual interruption but using non masker bull interruption from the start in order to solve this problem, now, the following problems pointed out by the above-mentioned patent occur.
[0004] That is, when notifying a failure by non masker bull interruption to a central processing unit, there is no involvement in the run state of a central processing unit, and since interruption of the advice of failure generating from diagnostic equipment is performed, if processing which does not permit interruption in the middle of processing with a central processing unit is performed, the problem of it becoming impossible to return to the original processing normally after activation of error processing by interruption from diagnostic equipment will occur.
[0005] Therefore, the main objects of this invention are to solve the above-mentioned problem which the method with which failure generating is notified only by non masker bull interruption has, without using the usual interrupt level.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to amelioration of the logging method of the fault information performed by the central processing unit, when failure generating in the system from diagnostic equipment is especially notified to a central processing unit about the storage which memorized the failure logging system, the approach, and the program.
[0002]
[Description of the Prior Art] Conventionally, it has been carried out to such a failure logging method by the approach of changing the interrupt level to a central processing unit. For example, if diagnostic equipment detects a certain failure, when the masker bull interruput signal in which the mask of a central processing unit is possible will notify and an error-processing completion report will not come by patent No. 2746184 in predetermined time, the central processing unit has notified by non masker bull interruption in which a mask is impossible.
[0003]
[Problem(s) to be Solved by the Invention] However, in a Prior art, one interrupt level general for actuation which is called error processing and which is not usually processing will be used, the usual interrupt request was interrupted and there was a problem that overhead processing called decoding of a factor was needed. Although there is also a method of not using the usual interruption but using non masker bull interruption from the start in order to solve this problem, now, the following problems pointed out by the above-mentioned patent occur.
[0004] That is, when notifying a failure by non masker bull interruption to a central processing unit, there is no involvement in the run state of a central processing unit, and since interruption of the advice of failure generating from diagnostic equipment is performed, if processing which does not permit interruption in the middle of processing with a central processing unit is performed, the problem of it becoming impossible to return to the original processing normally after activation of error processing by interruption from diagnostic equipment will occur.
[0005] Therefore, the main objects of this invention are to solve the above-mentioned problem which the method with which failure generating is notified only by non masker bull interruption has, without using the usual interrupt level.
[0006]
[Means for Solving the Problem] In the failure logging system according to this invention in order to attain the above-mentioned object An advice means to notify generating of the failure in a system to a central processing unit by non masker bull interruption, The mask control means which controls whether the mask of the advice of interruption is carried out according to directions of a central processing unit, A judgment means to judge whether the error-processing termination response which shows that error processing by the central processing unit was completed was received in predetermined time, A mask discharge means for a judgment means to judge with an error-processing termination response not being received in predetermined time, and to cancel a mask, to interrupt compulsorily while a mask control means interrupts with directions of a central processing unit and is carrying out the mask of the advice, and to give advice to a

central processing unit is established..
[0007] Moreover, it sets to the failure logging approach by this invention. The advice procedure which notifies failure generating in a system to a central processing unit by non masker bull interruption, The mask control procedure which controls whether the mask of the advice of interruption is carried out according to directions of a central processing unit, Whether the error-processing termination response which shows that error processing by the central processing unit was completed was received in predetermined time with the judgment procedure to judge and a judgment procedure The mask discharge procedure of being judged with an error-processing termination response not being received in predetermined time, and canceling a mask, interrupting compulsorily when it interrupts with a mask control procedure according to directions of a central processing unit and the mask of the advice is carried out, and giving advice to a central processing unit is formed.
[0008] Moreover, the advice processing which notifies failure generating in a system to a central processing unit by non masker bull interruption in the storage by this invention, The masking control processing which controls whether the mask of the advice of interruption is carried out according to directions of a central processing unit, Whether the error-processing termination response which shows that error processing by the central processing unit was completed was received in predetermined time by the judgment processing to judge and judgment processing It is judged with an error-processing termination response not being received in predetermined time. By and masking control processing When it interrupts according to directions of a central processing unit and the mask of the advice is carried out, the program for performing mask discharge processing in which cancel a mask, interrupt compulsorily and advice is given to a central processing unit is memorized.
[0009] Moreover, when a central processing unit interrupts and it has lapsed into the endless loop by the masked state, you may make it save failure hysteresis in the above-mentioned failure logging system, an approach, and a storage. Furthermore, the output terminal of a mask control means may be connected to the non masker bull interruption terminal of a central processing unit in the above-mentioned failure logging system.
[0010] The masked state according generating of the failure in a <operation> system to a controllable mask control means is confirmed with a central processing unit, it notifies to a central processing unit by non masker bull interruption, the content by which the mask was carried out with the central processing unit when the error-processing termination response which shows that error processing by the central processing unit which answered this interruption was completed was not received in predetermined time is disregarded, and masker bull interruption of a central processing unit notifies.
[0011] Before a central processing unit starts the processing which does not permit interruption by this, by the mask control means in diagnostic equipment If the mask of the advice of failure generating by non masker bull interruption is carried out Since error processing is performed when a certain failure occurs at the event, it changes into the condition that processing is not interrupted by interruption of advice of a failure and interruption can be permitted and a mask is opened, it becomes possible after failure logging processing to return normally.
[0012] Furthermore, since the mask which the central processing unit performed after predetermined time is disregarded and it is compulsorily notified by non masker bull interruption even when having resulted in the endless loop, while it was made the calamity and the central processing unit had carried out the mask of the advice of failure generating, it becomes possible to leave failure hysteresis, the omission of data required for failure analysis is lost, and improvement in failure analysis can be aimed at.
[0013]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with a drawing. Drawing 1 is the block diagram showing the failure logging structure of a system by the gestalt of operation of this invention. In drawing 1 , diagnostic equipment (DGU) 4 is respectively connected to a central processing unit 1, main storage 2, and a peripheral control unit 3 according to the individual through the diagnostic buses 101-103 while connecting with a central processing unit (CPU) 1, main storage (MEM) 2 and a peripheral control unit (PCU) 3 through a system bus 100.

[0014] Diagnostic equipment 4 consists of the diagnostic control section 40, the advice section 41 of interruption which notifies generating of a failure, the failure detection section 43 which detects generating of a failure [in / through the controllable mask control section 42 and the diagnostic buses 101-103 / in whether the mask of the advice of a failure is carried out with directions of a central processing unit 1 / a central processing unit 1, main storage 2, and a peripheral control unit 3], an error-processing termination response receive section 44 which receives the error-processing terminate signal 121 from a central processing unit 1, and the timer section 45.
[0015] The interruption reception section 10 in which a central processing unit 1 receives interruption from the advice section 41 of interruption of diagnostic equipment 4 as non masker bull interruption, The error-processing terminate-signal control section 11 which notifies termination of error processing performed when the interruption reception section 10 receives interruption from diagnostic equipment 4, It has the mask control unit 12 which controls the mask control section 42 in the diagnostic equipment 4 which carries out the mask of the interruption before the processing which does not permit interruption which notifies failure generating from diagnostic equipment 4.
[0016] In addition, although one peripheral control unit 3 is connected to a system bus 100 in drawing 1 , originally two or more peripheral control units 3 shall be connected to a system bus 100.
[0017] Next, actuation of the gestalt of this operation is explained using the flow chart of drawing 1 and drawing 2 . If a certain abnormalities occur in a system, the failure detection section 43 of the diagnostic equipment 4 which is supervising the whole system through the diagnostic buses 101-103 will detect the failure. The diagnostic control section 40 answers and interrupts advice from the failure detection section 43, starts the advice section 41, outputs the advice signal 111 of failure generating to a central processing unit 1 according to the condition of the mask control section 42 from the advice section 41 of interruption, and notifies generating of a failure.
[0018] Supposing a central processing unit 1 accesses the mask control section 42 and it has made it into the masked state here, a mask will work in the mask control section 42, and the advice signal 111 of failure generating will not be outputted to a central processing unit 1. The advice signal 111 of failure generating is outputted for a central processing unit 1 to a central processing unit 1 for the first time in a mask at the time of an open beam.
[0019] Drawing 2 shows the case where the central processing unit 1 has lapsed into the endless loop where the mask of advice interruption of a failure is performed. In this condition, since the advice signal 111 of failure generating is not outputted to a central processing unit 1, error processing is not performed.
[0020] If the error-processing termination response receive section 44 does not receive the error-processing termination response by the error-processing terminate signal 121 in the predetermined time which the timer section 45 clocks from the error-processing terminate-signal control section 11 of a central processing unit 1 the diagnostic control section 40 That is, if a central processing unit 1 lapses into an endless loop where the mask of advice interruption of a failure is performed, and advice of failure generating is not outputted to the interruption reception section 10 of a central processing unit 1, the advice from the timer section 45 detects a time-out.
[0021] If the time-out to the error-processing termination response from a central processing unit 1 is detected, the diagnostic control section 40 will access the mask control section 42, and will cancel compulsorily the mask made by the central processing unit 1. The signal outputted from the advice section 41 of interruption is outputted to the interruption reception section 10 of a central processing unit 1 as an advice signal 111 of failure generating by this.
[0022] Non masker bull interruption processing will be started, a central processing unit 1 will interrupt, if the interruption reception section 10 receives non masker bull interruption, conditions are investigated, and it judges whether it is the failure generating report from diagnostic equipment 4. If it judges with interruption not being the failure generating report from diagnostic equipment 4, it will shift to another processing.
[0023] Moreover, if a central processing unit 1 judges with interruption being the failure generating report from diagnostic equipment 4, it investigates the content of a failure, collects fault information, and records and saves the fault information in failure log area.

[0024] After failure logging processing is completed, a central processing unit 1 makes the error-processing terminate signal 121 output from the error-processing terminate-signal control section 11, performs an error-processing termination response to diagnostic equipment 4, and ends failure logging processing.
[0025] The diagnostic control section 40 of diagnostic equipment 4 will end failure logging processing, if the error-processing termination response by the error-processing terminate signal 121 from the error-processing terminate-signal control section 11 of a central processing unit 1 comes.
[0026] Moreover, error processing of central processing unit 1 self is performed, without having already lapsed into the endless loop by the interruption masked state in the central processing unit 1, although it may be unable to return normally after error-processing activation to the original processing since it will be concerned with the run state of a central processing unit 1 if it is concerned with the masked state of the mask control section 42 and the advice signal of failure generating is outputted that there is nothing, and non masker bull interruption is started that there is nothing, and returning to the original processing after error-processing termination.
[0027] Thus, even if it notifies generating of the failure in a system only by non masker bull interruption, when the central processing unit 1 has not lapsed into an endless loop by forming the mask control section 42 with a controllable central processing unit 1 in diagnostic equipment 4 according to the gestalt of this operation, it can return to the original processing normally after failure logging processing activation.
[0028] Moreover, even if it is the case where the central processing unit 1 interrupted and it has lapsed into the endless loop by the masked state, it can leave failure hysteresis with a preservation means, and the omission of data required for failure analysis can be lost. The effectiveness of failure analysis can be raised by this. In addition, it is clear that this invention is not limited to the gestalt of the above-mentioned implementation, but the gestalt of the above-mentioned implementation may be suitably changed within the limits of the technical thought of this invention.
[0029] Moreover, when realizing this invention by the computer system which consists of a CPU and memory, the above-mentioned memory constitutes the storage by this invention. The program for performing processing by the flow chart of drawing 2 mentioned above is stored in this storage. Moreover, as this storage, a semiconductor memory, an optical disk, a magneto-optic disk, a magnetic medium, etc. can be used.
[0030]
[Effect of the Invention] As explained above, when diagnostic equipment detects the failure in a system according to this invention A central processing unit notifies generating of the failure according to the masked state of a controllable mask control section. The error-processing termination response which shows that error processing by the central processing unit performed by answering this advice was completed By disregarding the masked state of a mask control section and having notified generating of a failure by non masker bull interruption compulsorily, when not received in the predetermined time set up beforehand When the central processing unit 1 has not lapsed into an endless loop, it can return to the original processing normally after failure logging processing activation. Moreover, even when the central processing unit has lapsed into the endless loop, failure hysteresis can be saved and it is effective in the ability to lose the omission of data required for failure analysis.
[0031] Furthermore, since the interruption reception section in a central processing unit assigns only a non masker bull interruption terminal for error processing, it is effective in becoming possible to use a masker bull interruption terminal for general processing.

[Translation done.]

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CLAIMS

Claim(s)]
Claim 1] In the failure logging system which collects the fault information by control of a central processing nit when diagnostic equipment detects the failure in a system An advice means to notify said failure enerating to said central processing unit by non masker bull interruption, The mask control means which ontrols whether the mask of said advice of interruption is carried out according to directions of said central rocessing unit, A judgment means to judge whether the error-processing termination response which hows that error processing by said central processing unit was completed was received in predetermined me, Said judgment means judges with said error-processing termination response not being received in aid predetermined time. And the failure logging system characterized by having a mask discharge means cancel said mask and to give said advice of interruption compulsorily to said central processing unit while aid mask control means is carrying out the mask of said advice of interruption with directions of said central rocessing unit.
Claim 2] The failure logging system according to claim 1 characterized by establishing the preservation neans for saving failure hysteresis when said central processing unit interrupts and it has lapsed into the ndless loop by the masked state.
Claim 3] The failure logging system according to claim 1 characterized by connecting the output terminal of aid mask control means to the non masker bull interruption terminal of said central processing unit.
Claim 4] In the failure logging approach of collecting the fault information by control of a central processing nit when diagnostic equipment detects the failure in a system The advice procedure which notifies said ailure generating to said central processing unit by non masker bull interruption, The mask control rocedure which controls whether the mask of said advice of interruption is carried out according to irections of said central processing unit, Whether the error-processing termination response which shows at error processing by said central processing unit was completed was received in predetermined time with e judgment procedure to judge and said judgment procedure It is judged with said error-processing rmination response not being received in said predetermined time. With and said mask control procedure he failure logging approach characterized by having the mask discharge procedure of canceling said mask nd giving said advice of interruption compulsorily to said central processing unit when the mask of said dvice of interruption is carried out according to directions of said central processing unit.
Claim 5] The failure logging approach according to claim 4 characterized by forming the preservation rocedure for saving failure hysteresis when said central processing unit interrupts and it has lapsed into the ndless loop by the masked state.
Claim 6] The advice processing which notifies failure generating in a system to a central processing unit by on masker bull interruption, The masking control processing which controls whether the mask of said dvice of interruption is carried out according to directions of said central processing unit, Whether the error-rocessing termination response which shows that error processing by said central processing unit was ompleted was received in predetermined time by the judgment processing to judge and said judgment rocessing It is judged with said error-processing termination response not being received in said redetermined time. By and said masking control processing The storage which memorized the program for erforming mask discharge processing in which cancel said mask and said advice of interruption is

compulsorily given to said central processing unit when the mask of said advice of interruption is carried out according to directions of said central processing unit.
[Claim 7] The storage which memorized the program according to claim 6 which memorized the program for performing preservation processing for saving failure hysteresis when said central processing unit interrupts and it has lapsed into the endless loop by the masked state.

[Translation done.]

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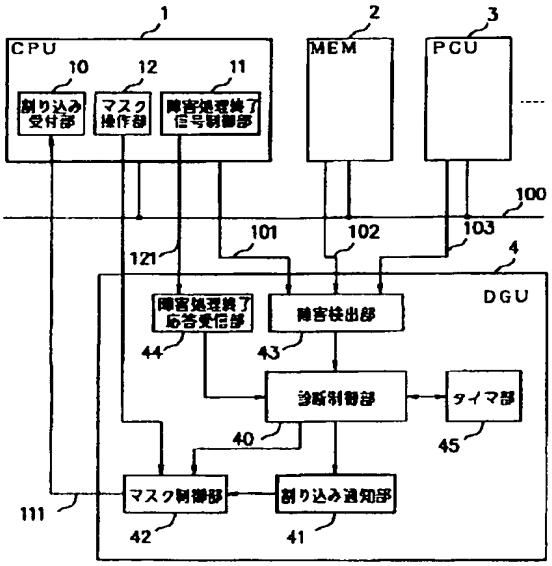
Ｆターム(参考)　5B042 GC07 KK07 LA20 MC15

(54)【発明の名称】　障害ロギングシステム、方法およびプログラムを記憶した記憶媒体

(57)【要約】
【課題】　中央処理装置が無限ループに陥っている場合でも、障害履歴を残し、障害解析に必要なデータの記載漏れを無くす。
【解決手段】　診断装置４の障害検出部４３がシステム内の障害を検出すると、診断制御部４０は、中央処理装置１により制御可能なマスク制御部４２のマスク状態に従って中央処理装置１に割り込み信号を出力する。診断制御部４０は、割り込み通知した後に、タイマ部４５が計時する所定時間内に障害処理終了応答受信部４４が障害処理終了信号１２１を受信しなければ、マスク制御部４２のマスク状態を無効化し、中央処理装置１にノンマスカブル割り込み通知を出力する。



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【特許請求の範囲】

【請求項1】　診断装置がシステム内の障害を検出した時に中央処理装置の制御によりその障害情報を収集する障害ロギングシステムにおいて、

前記障害発生を前記中央処理装置にノンマスカブル割り込みで通知する通知手段と、

前記割り込み通知をマスクするか否かを前記中央処理装置の指示に応じて制御するマスク制御手段と、

前記中央処理装置による障害処理が終了したことを示す障害処理終了応答が所定時間内に受信されたか否かを判定する判定手段と、

前記判定手段が、前記障害処理終了応答が前記所定時間内に受信されないと判定し、かつ前記マスク制御手段が、前記中央処理装置の指示により前記割り込み通知をマスクしている時、前記マスクを解除して強制的に前記割り込み通知を前記中央処理装置に与えるマスク解除手段とを有することを特徴とする障害ロギングシステム。

【請求項2】　前記中央処理装置が割り込みマスク状態で無限ループに陥っている場合に、障害履歴を保存するための保存手段を設けたことを特徴とする請求項1記載の障害ロギングシステム。

【請求項3】　前記マスク制御手段の出力端子が前記中央処理装置のノンマスカブル割り込み端子に接続されていることを特徴とする請求項1記載の障害ロギングシステム。

【請求項4】　診断装置がシステム内の障害を検出した時に中央処理装置の制御によりその障害情報を収集する障害ロギング方法において、

前記障害発生を前記中央処理装置にノンマスカブル割り込みで通知する通知手順と、

前記割り込み通知をマスクするか否かを前記中央処理装置の指示に応じて制御するマスク制御手順と、

前記中央処理装置による障害処理が終了したことを示す障害処理終了応答が所定時間内に受信されたか否かを判定する判定手順と、

前記判定手順により、前記障害処理終了応答が前記所定時間内に受信されないと判定され、かつ前記マスク制御手順により、前記中央処理装置の指示に応じて前記割り込み通知がマスクされている時、前記マスクを解除して強制的に前記割り込み通知を前記中央処理装置に与えるマスク解除手順とを有することを特徴とする障害ロギング方法。

【請求項5】　前記中央処理装置が割り込みマスク状態で無限ループに陥っている場合に、障害履歴を保存するための保存手順を設けたことを特徴とする請求項4記載の障害ロギング方法。

【請求項6】　システム内の障害発生を中央処理装置にノンマスカブル割り込みで通知する通知処理と、

前記割り込み通知をマスクするか否かを前記中央処理装置の指示に応じて制御するマスク制御処理と、

2

前記中央処理装置による障害処理が終了したことを示す障害処理終了応答が所定時間内に受信されたか否かを判定する判定処理と、

前記判定処理により、前記障害処理終了応答が前記所定時間内に受信されないと判定され、かつ前記マスク制御処理により、前記中央処理装置の指示に応じて前記割り込み通知がマスクされている時、前記マスクを解除して強制的に前記割り込み通知を前記中央処理装置に与えるマスク解除処理とを実行するためのプログラムを記憶した記憶媒体。

【請求項7】　前記中央処理装置が割り込みマスク状態で無限ループに陥っている場合に、障害履歴を保存するための保存処理を実行するためのプログラムを記憶した請求項6記載のプログラムを記憶した記憶媒体。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、障害ロギングシステム、方法およびプログラムを記憶した記憶媒体に関し、特に診断装置からのシステム内の障害発生が中央処理装置に通知された時に、中央処理装置によって実行される障害情報のロギング方式の改良に関する。

【0002】

【従来の技術】従来、このような障害ロギング方式には、中央処理装置への割り込みレベルを変える方法により行われてきた。例えば、特許第2746184号では、何らかの障害を診断装置が検出すると、中央処理装置のマスク可能なマスカブル割り込み信号により通知し、所定時間内に障害処理完了報告がこない場合は、中央処理装置では、マスク不可能なノンマスカブル割り込みで通知している。

【0003】

【発明が解決しようとする課題】ところが、従来の技術では、障害処理といった通常処理ではない動作のために、一般の割り込みレベルがひとつ使われてしまい、通常の割り込み要求に割り込み要因のデコード処理というオーバーヘッド処理が必要になるという問題があった。この問題を解決するために、通常の割り込みを使用せず、初めからノンマスカブル割り込みを使用するという方法もあるが、これでは、上記の特許で指摘された以下のような問題が発生する。

【0004】即ち、中央処理装置に対してノンマスカブル割り込みで障害を通知する場合、中央処理装置の走行状態にかかわりなく、診断装置からの障害発生通知の割り込みが行われるので、中央処理装置で処理途中での割り込みを許容しない処理が実行されていると、診断装置からの割り込みによる障害処理の実行後に、元の処理に正常に復帰できなくなる可能性がある、という問題が発生する。

【0005】従って、本発明の主な目的は、通常の割り込みレベルを使用することなく、ノンマスカブル割り込

みのみで障害発生が通知される方式の持つ上記問題を解消することにある。

【0006】

【課題を解決するための手段】上記の目的を達成するために、本発明による障害ロギングシステムにおいては、システム内の障害の発生を中央処理装置にノンマスカブル割り込みで通知する通知手段と、割り込み通知をマスクするか否かを中央処理装置の指示に応じて制御するマスク制御手段と、中央処理装置による障害処理が終了したことを示す障害処理終了応答が所定時間内に受信されたか否かを判定する判定手段と、判定手段が、障害処理終了応答が所定時間内に受信されないと判定し、かつマスク制御手段が、中央処理装置の指示により割り込み通知をマスクしている時、マスクを解除して強制的に割り込み通知を中央処理装置に与えるマスク解除手段とを設けている。

【0007】また、本発明による障害ロギング方法においては、システム内の障害発生を中央処理装置にノンマスカブル割り込みで通知する通知手順と、割り込み通知をマスクするか否かを中央処理装置の指示に応じて制御するマスク制御手順と、中央処理装置による障害処理が終了したことを示す障害処理終了応答が所定時間内に受信されたか否かを判定する判定手順と、判定手順により、障害処理終了応答が所定時間内に受信されないと判定され、かつマスク制御手順により、中央処理装置の指示に応じて割り込み通知がマスクされている時、マスクを解除して強制的に割り込み通知を中央処理装置に与えるマスク解除手順とを設けている。

【0008】また、本発明による記憶媒体においては、システム内の障害発生を中央処理装置にノンマスカブル割り込みで通知する通知処理と、割り込み通知をマスクするか否かを中央処理装置の指示に応じて制御するマスク制御処理と、中央処理装置による障害処理が終了したことを示す障害処理終了応答が所定時間内に受信されたか否かを判定する判定処理と、判定処理により、障害処理終了応答が所定時間内に受信されないと判定され、かつマスク制御処理により、中央処理装置の指示に応じて割り込み通知がマスクされている時、マスクを解除して強制的に割り込み通知を中央処理装置に与えるマスク解除処理とを実行するためのプログラムを記憶している。

【0009】また、上記障害ロギングシステム、方法および記憶媒体において、中央処理装置が割り込みマスク状態で無限ループに陥っている場合に、障害履歴を保存するようにしてよい。さらに、上記障害ロギングシステムにおいて、マスク制御手段の出力端子が中央処理装置のノンマスカブル割り込み端子に接続されていてよい。

【0010】<作用>システム内の障害の発生を中央処理装置で制御可能なマスク制御手段によるマスク状態を有効として、中央処理装置にノンマスカブル割り込みで通知し、この割り込みに応答した中央処理装置による障害処理が終了したことを示す障害処理終了応答が所定時間内に受信されない時に、中央処理装置によりマスクされた内容を無視して、中央処理装置のマスカブル割り込みにより通知する。

【0011】これによって、中央処理装置が割り込みを許容しない処理に入る前に、診断装置内のマスク制御手段により、ノンマスカブル割り込みによる障害発生通知をマスクしてしまえば、もし、その時点で何らかの障害が発生した場合でも、障害通知の割り込みにより処理が中断されることがなく、割り込みを許容できる状態になって、マスクを開いた時に、障害処理が実行されるため、障害ロギング処理の後、正常に復帰することが可能となる。

【0012】さらに、不幸にして中央処理装置が障害発生通知をマスクしたままで、無限ループに至っている場合でも、所定時間後、中央処理装置が行ったマスクを無視して強制的にノンマスカブル割り込みにより通知されるので、障害履歴を残すことが可能となり、障害解析に必要なデータの記載漏れを無くして、障害解析の向上が図れる。

【0013】

【発明の実施の形態】以下、本発明の実施の形態を図面と共に説明する。図1は本発明の実施の形態による障害ロギングシステムの構成を示すブロック図である。図1において、診断装置（ＤＧＵ）４は、システムバス１００を介して中央処理装置（ＣＰＵ）１と主記憶装置（ＭＥＭ）２と周辺制御装置（ＰＣＵ）３とに接続されると共に、診断バス１０１～１０３を介して中央処理装置１と主記憶装置２と周辺制御装置３とに各々個別に接続されている。

【0014】診断装置４は、診断制御部４０と、障害の発生を通知する割り込み通知部４１と、中央処理装置１の指示により障害通知をマスクするか否かを制御可能なマスク制御部４２と、診断バス１０１～１０３を通じて中央処理装置１と主記憶装置２と周辺制御装置３とにおける障害の発生を検出する障害検出部４３と、中央処理装置１からの障害処理終了信号１２１を受信する障害処理終了応答受信部４４と、タイマ部４５とから構成されている。

【0015】中央処理装置１は、診断装置４の割り込み通知部４１からの割り込みを、ノンマスカブル割り込みとして受け付ける割り込み受付部１０と、割り込み受付部１０が診断装置４からの割り込みを受け付けたときに実行される障害処理の終了を通知する障害処理終了信号制御部１１と、診断装置４からの障害発生を通知する割り込みを許容しない処理の前に、その割り込みをマスクする診断装置４内のマスク制御部４２を制御するマスク操作部１２とを有している。

【0016】なお、図1ではシステムバス１００に1つの周辺制御装置３を接続しているが、本来、システムバ

5

ス１００には複数の周辺制御装置３が接続されているものとする。

【００１７】次に、図１および図２のフローチャートを用いて本実施の形態の動作について説明する。システム内に何らかの異常が発生すると、診断バス１０１～１０３を通じてシステム全体の監視を行っている診断装置４の障害検出部４３が、その障害を検出する。診断制御部４０は、障害検出部４３からの通知に応答して割り込み通知部４１を起動し、割り込み通知部４１からマスク制御部４２の状態に応じて障害発生通知信号１１１を中央処理装置１に出力して障害の発生を通知する。

【００１８】もし、ここで中央処理装置１がマスク制御部４２をアクセスしてマスク状態にしてあるとすると、マスク制御部４２においてマスクが働き、障害発生通知信号１１１は中央処理装置１には出力されない。中央処理装置１がマスクを開けた時に初めて中央処理装置１に障害発生通知信号１１１が出力される。

【００１９】図２では、中央処理装置１が障害通知割り込みのマスクを行った状態で、無限ループに陥ってしまった場合を示している。この状態では、中央処理装置１には障害発生通知信号１１１は出力されないので、障害処理は行われない。

【００２０】診断制御部４０は、タイマ部４５が計時する所定時間内に中央処理装置１の障害処理終了信号制御部１１から障害処理終了信号１２１による障害処理終了応答を、障害処理終了応答受信部４４が受信しなければ、つまり、中央処理装置１が、障害通知割り込みのマスクを行った状態で無限ループに陥ってしまって、中央処理装置１の割り込み受付部１０に障害発生通知が出力されなければ、タイマ部４５からの通知によってタイムアウトを検出する。

【００２１】診断制御部４０は、中央処理装置１からの障害処理終了応答に対するタイムアウトを検出すると、マスク制御部４２をアクセスして、中央処理装置１によってなされたマスクを強制的に解除する。これによって、割り込み通知部４１から出力された信号は障害発生通知信号１１１として、中央処理装置１の割り込み受付部１０に出力される。

【００２２】中央処理装置１は、割り込み受付部１０がノンマスカブル割り込みを受信すると、ノンマスカブル割り込み処理を起動して割り込み条件を調査し、それが診断装置４からの障害発生報告か否かを判定する。割り込みが診断装置４からの障害発生報告ではないと判定すると、別処理に移行する。

【００２３】また、中央処理装置１は、割り込みが診断装置４からの障害発生報告であると判定すると、障害内容を調査して障害情報を収集し、その障害情報を障害ログエリアに記録し保存する。

【００２４】中央処理装置１は障害ロギング処理が終了すると、障害処理終了信号制御部１１から障害処理終了信号１２１を出力させて、診断装置４に障害処理終了応答を行い、障害ロギング処理を終了する。

6

【００２５】診断装置４の診断制御部４０は、中央処理装置１の障害処理終了信号制御部１１からの障害処理終了信号１２１による障害処理終了応答がくると、障害ロギング処理を終了する。

【００２６】また、マスク制御部４２のマスク状態に関わりなく障害発生通知信号が出力されると、中央処理装置１の走行状態に関わりなくノンマスカブル割り込みが起動されるので、障害処理実行後に元の処理に正常に復帰できない可能性があるが、中央処理装置１においては、既に割り込みマスク状態で無限ループに陥っており、障害処理終了後に元の処理に復帰することなく、中央処理装置１自身の障害処理が行われる。

【００２７】このように、本実施の形態によれば、システム内の障害の発生をノンマスカブル割り込みのみで通知するようにしても、診断装置４内に中央処理装置１が制御可能なマスク制御部４２を設けることによって、中央処理装置１が無限ループに陥っていない場合は、障害ロギング処理実行後に元の処理に正常に復帰することができる。

【００２８】また、中央処理装置１が割り込みマスク状態で無限ループに陥っている場合であっても、障害履歴を保存手段により残すことができ、障害解析に必要なデータの記載漏れを無くすることができる。これによって、障害解析の効果を向上させることができる。なお、本発明は上記実施の形態に限定されず、本発明の技術思想の範囲内において、上記実施の形態は適宜変更され得ることは明らかである。

【００２９】また、本発明をＣＰＵとメモリとで構成されるコンピュータシステムで実現する場合、上記メモリは本発明による記憶媒体を構成する。この記憶媒体には、前述した図２のフローチャートによる処理を実行するためのプログラムが格納される。また、この記憶媒体としては、半導体記憶装置、光ディスク、光磁気ディスク、磁気媒体等を用いることができる。

【００３０】

【発明の効果】以上説明したように、本発明によれば、診断装置がシステム内の障害を検出した時に、その障害の発生を中央処理装置が制御可能なマスク制御部のマスク状態に従って通知し、この通知に応答して行われる中央処理装置による障害処理が終了したことを示す障害処理終了応答が、予め設定された所定時間内に受信されない時に、障害の発生をマスク制御部のマスク状態を無視して強制的にノンマスカブル割り込みで通知するようにしたことにより、中央処理装置１が無限ループに陥っていない場合は、障害ロギング処理実行後に元の処理に正常に復帰することができる。また、中央処理装置が無限ループに陥っている場合でも、障害履歴を保存することができ、障害解析に必要なデータの記載漏れを無くする

ことができるという効果がある。

【0031】さらに、中央処理装置内の割り込み受付部は、障害処理のためにノンマスカブル割り込み端子のみを割り当てるので、マスカブル割り込み端子を一般の処理に使うことが可能となるという効果がある。

【図面の簡単な説明】

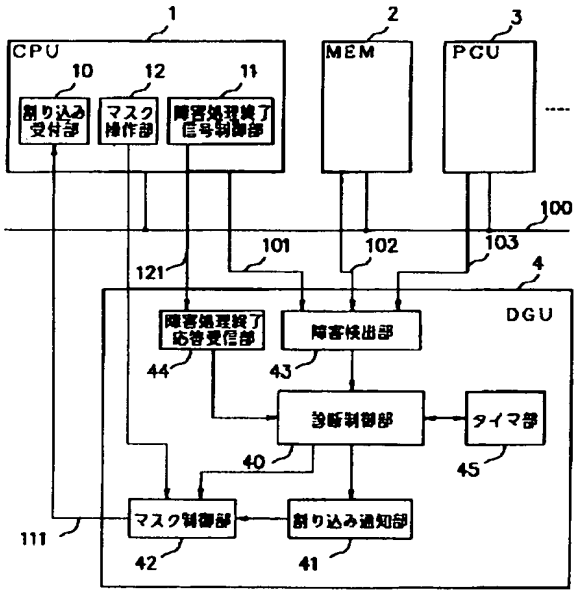
【図1】本発明の実施の形態による障害ロギングシステムの構成を示すブロック図である。

【図2】本発明の実施の形態の動作を示すフローチャートである。

【符号の説明】

1　中央処理装置
2　主記憶装置
3　周辺制御装置
4　診断装置
10　割り込み受付部
11　障害処理終了信号制御部
12　マスク操作部
40　診断制御部
41　割り込み通知部
42　マスク制御部
43　障害検出部
44　障害処理終了応答受信部
45　タイマ部
111　障害発生通知信号
121　障害処理終了信号

【図1】



【図2】